

CLAIMS

1. A surgical instrument comprising:

an elongated instrument shaft having proximal and distal ends;

a tool disposed from the distal end of the instrument shaft; and

a control handle disposed from the proximal end of the instrument shaft;

said tool being coupled to the distal end of said elongated instrument shaft via a first movable member;

said control handle coupled to the proximal end of said elongated instrument shaft via a second movable member;

whereby movement of said control handle with respect to said elongated instrument shaft via said second movable member causes attendant movement of said tool with respect to said elongated instrument shaft via said first movable member;

wherein at least one of said first and second members comprises a bendable motion member.

2. The surgical instrument of claim 1 further including a control element that intercouple between said first and second movable members so that a movement of the control handle at the second movable member causes a movement of tool via the first movable member.

3. The surgical instrument of claim 2 wherein said control element comprises a cable system that interconnects the first and second movable members, said cable system being actuated by the movement of the control handle to, in turn, move the tool.

4. The surgical instrument of claim 1 wherein each of the movable members have two degree of freedom to provide motion in all directions.
5. The surgical instrument of claim 1 wherein both of the movable members comprise a bendable motion member, each bendable motion member providing at least one degree of freedom and the bending stiffness of the second movable member is greater than the bending stiffness of the first movable member.
6. The surgical instrument of claim 5 wherein each of the bendable motion members have two degree of freedom to provide motion in all directions.
7. The surgical instrument of claim 5 wherein the control handle comprises a push-pull tool actuation arrangement.
8. The surgical instrument of claim 1 wherein the tool movement with respect to the distal end of the elongated shaft is in the opposite direction of the control handle movement with respect to the proximal end of the elongated shaft.
9. The surgical instrument of claim 1 wherein the tool movement with respect to the distal end of the elongated shaft is in the same direction of the control handle movement with respect to the proximal end of the elongated shaft.
10. The surgical instrument of claim 1 wherein the control handle comprises a pull-pull tool actuation arrangement.
11. The surgical instrument of claim 1 wherein the elongated instrument shaft includes at least a flexible segment thereof.
12. The surgical instrument of claim 1 wherein the tool is selected from a group comprising a jaw, gripper, clip applier, stapler, electrosurgery device, scalpel and scissors.

13. The surgical instrument of claim 1 further including another proximal movable member and another distal movable member for multi-modal controlled movement of the tool.

14. The surgical instrument of claim 1 wherein the second movable member is able to axially rotate about the control handle.

15. The surgical instrument of claim 1 further including a distal axial rotation joint for axially rotating the first movable member about the elongated shaft.

16. The surgical instrument of claim 1 further including a distal axial rotation joint for axially rotating the tool about the first movable member.

17. The surgical instrument of claim 1 further including distal and proximal rotation joints wherein the proximal axial rotation joint actuates the distal axial rotation joint.

18. The surgical instrument of claim 1 further including a motion member locking mechanism for releasably locking said movable members.

19. The surgical instrument of claim 1 further including an electromechanical actuator for driving at least one degree of freedom movement of the tool.

20. A surgical instrument comprising:

an elongated instrument shaft having proximal and distal ends;

a tool disposed from the distal end of the instrument shaft; and

a control handle disposed from the proximal end of the instrument shaft;

said tool being coupled to the distal end of said elongated instrument shaft via a movable member;

said control handle coupled to the proximal end of said elongated instrument shaft via a torque sensing member;

an electromechanical actuator coupled to said movable member;

wherein torque applied at said torque sensing member by the operator produces a proportional movement of said actuator, which in turn produces a movement of said tool with respect to said elongated instrument shaft via said movable member.